

Translated from the German

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Title in German of the object of the invention: Abdeckvorrichtung zur Behandlung der Haut von gelartigen Polymerisaten

**COVERING DEVICE FOR THE TREATMENT OF THE SKIN ON THE BASIS  
OF GELATINOUS POLYMERS**

The invention pertains to a covering device for the treatment of the skin - in particular for the treatment of burns, wounds and skin lesions - on the basis of gelatinous polymers.

For the therapy of large-area wounds, e.g., heavy burn traumas, it is required that the covering material is having exceedingly multifarious, partially conflicting properties, which the known devices until recently only insufficiently possess. Thus, the covering material - on the one hand - should be suitable for the absorption of wound secretion, however - on the other hand - it should keep as low as possible water- and protein losses of the patient. The covering material

should provide an opportunity for heat- and gas exchange, however, it should prevent the ingress of bacteria and viruses. It should provide an opportunity for a change, which is as much as possible painless, however, should be capable of stimulating the granulation of the skin by means of a moist medium, and also should provide a dilution of secretion and toxins as a result of water supply. Moreover, it is required that a possibility is provided for the epicutaneous application of medications.

Therefore, generally speaking, natural materials such as pork=s skin or autologous transplants are used in the practice for the treatment of wounds, however, only after the necrotic tissue has been removed. Indeed, transplants are to be preferred to pork=s skin, however, they are not applicable in the first stage of the wound sanitization, namely cleaning of the wound. Besides, they are not usually available in the required quantity.

It is also known that cross-linked, gelatinous polymers, i.e. water-containing polymer masses, such as, e.g., cross-linked polyacrylamide gel, or agar gel are used for the treatment of wounds and in dermatology. However, those polymer masses can be made only with much difficulty in a continuous way in the form of layers or foil-like structures, and besides this, exhibit serious imperfections during clinical use, because their handling is complicated.

Therefore, it is an object of the invention to propose yet another, improved means on the basis of gelatinous polymers fro the treatment of the skin, in particular for the treatment of burns, wounds, though also hand lesions and dermatological problems. The said means should provide an opportunity to the expert to treat certain skin lesions, for which - the recent covering devices are less suitable.

The set task is achieved by means of a covering device on the basis of gelatinous polymer

for the treatment of the skin, especially in the case of burn traumas and wounds. This devices is characterized in that the gelatinous polymer is completely or partially covered with a water-vapor and gas-permeable membrane.

In accordance with the definition, the term Agelatinous polymer® should denote a dimensionally stable, easily deformable mass of polymer, which possesses a high percentage of water relative to its weight.

Additional embodiment forms of the invention are cited in subclaims 2 thru 8.

The membrane, which at least partially covers the polymer surface, turned away from the skin, and is water-vapor permeable and gas-permeable, is in particular a membrane, having an average pore-size in the range of  $3 \times 10^{-4}$  to  $10 \mu\text{m}$ , and, e.g., consists of regenerated (semisynthetic) cellulose fiber (DE-AS 27 36 569), or an asymmetric plastic membrane of polyamide (DE-AS 27 51 910), or polycarbonate (DE-OS 25 10 33). Until recently, these membranes were used in the process of dialysis (pore size  $10^{-3}$  to  $10^{-2} \mu\text{m}$ ) or in hemofiltration, and exhibit a thickness from 10 to  $150 \mu\text{m}$ . The membrane exhibits surface or planar form. It is either foliated (lamellar), or possesses the shape of a hose, laid flat, which is sealed on its ends, e.g., in the form of a pouch, which surrounds the entire gelatinous polymer.

Inasmuch as the membrane only partially surrounds the gelatinous polymer, the part of the gelatinous polymer, which is not surrounded, is covered with a foliated woven fabric or non-woven fleece (adhesive bonded fabric), e.g., of polyethylene-, polyamide-, polyester-, or polypropylene fibers, or is having an open-pore plastic foam layer, e.g., of polyurethane foam, or covered with a paper or a porous plastic film.

In contradistinction to the cross-linked polymers, used until recently for the treatment of

wounds, the gelatinous polymer can be deformed in a particularly easy way, resp. is flowable. Its component, which does not consist of fluid, consists of, e.g., a cellulose ether {e.g., ethyl cellulose} or hydroxyethyl starch, in particular of hydroxyethyl cellulose, carboxymethyl cellulose, or methyl cellulose, or corresponding starch derivative. In addition to this, suitable cellulose ethers are alkylhydroxyalkyl ether, alkylcarboxymethyl ether, hydroxyalkylcarboxymethyl ether, and alkylhydroxyalkylcarboxymethyl ether.

Moreover, suitable gelatinous polymers are, e.g., gels on the basis of acrylic acid and methacrylic acid, or their derivatives, as well as poly(vinyl pyrrolidone), polyvinyl alcohol, agar or agarose.

However, it is also possible, to use chemically modified cellulose ethers, as described in DE-)S 19 12 740, 23 57 079, 23 58 150 and 25 19 927.

Also, cellulose ethers, modified with compounds, containing one-, two- or three-valent ions, are suitable gelatinous polymers.

Depending upon the purpose of application, the layer thickness of the gelatinous polymer can vary in a wide range, however, it is functionally at about 1 to 5 mm. When a covering device, having a transparent, gelatinous polymer and a transparent membrane, is sued for the treatment of skin lesions, the healing process can advantageously be monitored and controlled in an optical way.

In an additional embodiment form, the membrane is connected to a storage tank for medications. For example, this storage tank for medications is formed by a liquid-proof foil, which covers the membrane on the side, turned away from the skin to be treated, and forms a hollow chamber with that side. The surface of the membrane, which is adjacent to this

hollow chamber, is - where applicable - covered with a liquid-proof foil, having openings, or predetermined breaking points, which are open only just prior to the using of the covering device. This hollow chamber is filled with, e.g., a bactericidal or therapeutically effective solution, which comes through the membrane into the gelatinous polymer, and then impacts the skin spot to be treated. Therewith, storage tank provides an opportunity for a rapid filling and/or continuous replenishment in a batched manner of liquid and medications into the covering device. In doing so, the velocity of proportioning or batching is governed by the kind and pore-size of the membrane. It is also possible to mix the gelatinous polymer with the therapeutically effective solution, already when the filling into a membrane hose is under way.

The covering device in accordance with the invention achieves the objectives et at the beginning. Moreover, the covering device can be manufactured in an economically feasible way, and can easily be handled under clinical conditions.

The figure shows a section of an embodiment form. It consists of a membrane in the form of a hose-pouch 1 and a gelatinous polymer 2.

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#### Patent Claims

1. Device for the treatment of the skin - in particular in the case of burn traumas, wounds, and skin lesions - on the basis of gelatinous polymer, characterized in that the gelatinous polymer is completely, or partially, surrounded by a water-vapor impermeable or gas-impermeable membrane.
2. Covering device as claimed in claim 1, characterized in that the membrane has an

average pore-size in the range of  $3 \times 10^{-4}$  to 10  $\mu\text{m}$ .

3. Covering device as claimed in claim 1 or 2, characterized in that the membrane is a dialysis membrane or hemofiltration membrane, having an average pore-size in the range of  $10^{-3}$  to  $10^{-2}$   $\mu\text{m}$ .

4. Covering device as claimed in one of claims 1 thru 3, characterized in that gelatinous polymer is partially surrounded by a woven fabric, open-pore plastic foam, non-woven fleece (adhesive bonded fabric), non-woven fabrics, paper, or perforated plastic film.

5. Covering device as claimed in one of claims 1 thru 3, characterized in that the membrane has the shape of a flatly laid hose, which is sealed or rendered waterproof on its ends.

6. Covering device as claimed in one of claims 1 thru 5, characterized in that the membrane together with a foil forms a hollow space for the accommodation of therapeutically effective means.

7. Covering device as claimed in one of claims 1 thru 6, characterized in that the gelatinous polymer is transparent and flowable.

8. Covering device as claimed in claim 7, characterized in that the gelatinous polymer contains carbohydrates, their derivatives, poly(vinyl pyrrolidone), polyvinyl alcohol, polyacrylic acid, or polymethacrylic acid and its derivatives.

## Explanation to the European Search Report

### Most characteristic words:

Europäische Recherchenbericht = European search report

Einschlägige Dokumente = pertinent documents

Patentansprüche = patent claims

betrifft Anspruch # = relates to claim #

Zeilen = lines

Seite = page

Spalte = column

Linke Spalte = left column

Unteransprüche = subclaims

Translated by John M Koytcheff, M.Sc. (Engrg.); WHO Postgr. Fellow (Env Engrg)

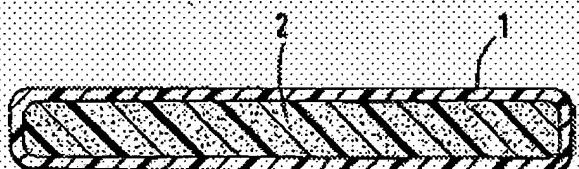
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